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NOTES

Installation and Use of the Microscope Within a Gastight Glove Box

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The adaptation of a high-resolution phase-contrast microscope for glove box use, which allows the stage and focusing knobs in the glovebox, although oculars and camera remain outside, is described.

Microbiological examination of lunar material received from the Apollo missions is performed within a biological barrier system designed for experimentation on extraterrestrial samples. Although the first lunar soils analyzed exhibited no viable forms, colored inorganic artifacts that resemble microbial clones appeared around some particles (1). The need for high-resolution microscopic examination of these particles and possible microbial growth elicited from future lunar samples has promoted the design of a microscope which can be used easily within a gastight glove box.

The use of a high-resolution microscope in a gastight safety cabinet has been described previously (2). This adaptation required positioning the entire microscope within the cabinet. Viewing was facilitated by tubular extensions from the cabinet window. The photographic equipment remained outside the barrier and unattached to the microscope; therefore, good clear photographs could not be obtained in this system.

This report describes a simple modification of a commercially available phase-contrast microscope which allows attachment of the microscope and camera. The barrier is constructed through the microscope. The microscope is mounted on the barrier wall such that the power supply, stage, and focusing knobs are within the barrier, although the oculars and camera attachments are on the outside (Fig. 1). Construction modifications to both the glove box and microscope are simple adaptations and can be utilized easily by anyone requiring high-resolution microscopy and photography in closed gastight systems.

The Leitz laborlux microscope mounted with phase-contrast objectives and Heine condenser (E. Leitz, Inc., New York) has been used for this purpose. The microscope is constructed such that it can be disassembled at a joint within the tube shaft of the microscope. This separation allows placement of the microscope body inside the barrier and allows the ocular head outside to retain full flexibility of the oculars. Any microscope that is similarly designed and allows focusing by movement of the stage can be employed.

Only minor changes have been made in the cabinet. The original angled window of the glove box was replaced with a vertical pane of glass which was attached to the side of the glove box by a horizontal plate. A 63-mm bore was cut into the plate and a connecting microscope adaptor was constructed to be inserted in the hole (Fig. 1, insert). A piece of polished optical glass (38 mm in diameter by 3.5 mm in thickness) was placed in the adaptor and sealed with epoxy. A rubber gasket placed between the adaptor and cabinet ledge provided a gastight fit. This became the new barrier between the cabinet and its exterior. The microscope was reassembled with the barrier adaptor between the two sections. The microscope body was centered and raised around the adaptor by a screw-adjusted platform placed under the microscope. Part or all of the microscope can be easily removed without danger of rupturing the barrier. Sterilization of the glove box can be accomplished by ethylene oxide which does not harm either the microscope or the power supply.

The tube length from the objective lens to the eyepiece of the unmodified Leitz laborlux microscope is 170 mm. This length can be extended by 15 mm without distorting the field of view or affecting the resolution of either the low, high, or

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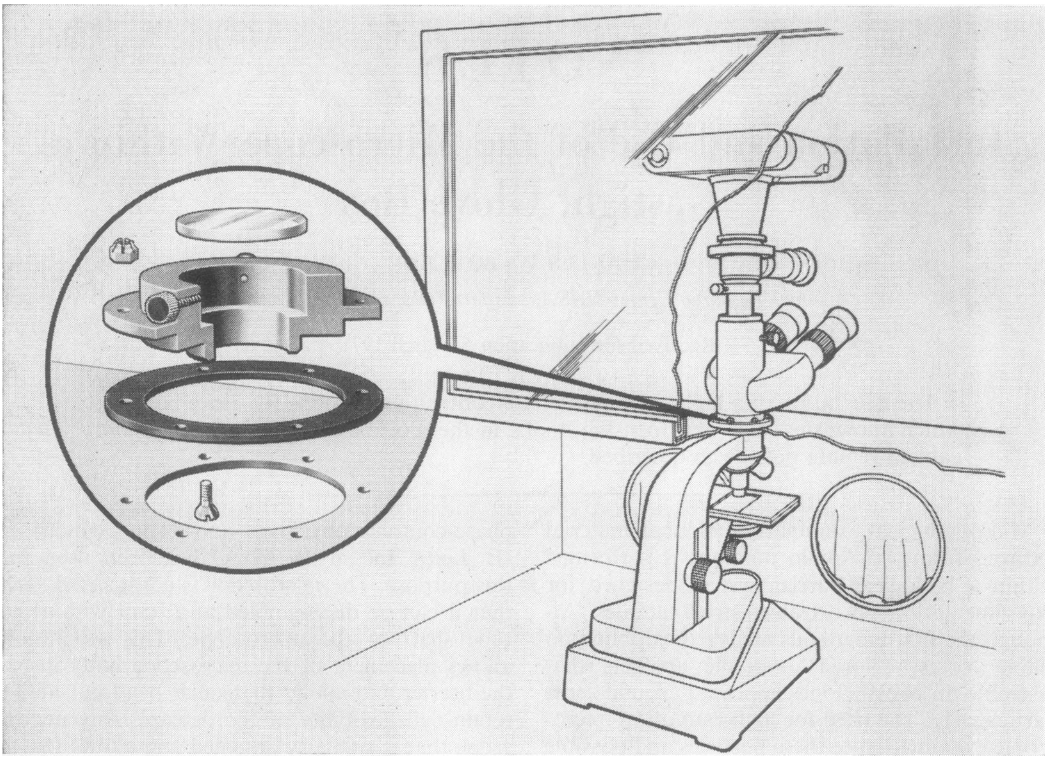

FIG. 1. *Schematic representation of the microscope assembled within the barrier system. The microscope stage and objectives are mounted on the inside of the barrier, whereas the oculars, microattachment, and camera are mounted on the outside. The insert shows (from top to bottom) a piece of polished optical glass, the metal adaptor designed to connect the two parts of the microscope, a rubber gasket, and the ledge of the cabinet. The screw-adjusted platform used to raise the microscope into position is not shown.*

oil immersion lenses. The tube length can be extended much greater distances by the use of infinity-corrected metalurgical lenses. However, in this situation we were able to stay within the 15-mm tolerance allowance and therefore used the regular lens. The extended tube length increased the magnifying power by a factor of 0.15 for all objectives. Neither resolution nor clarity was affected.

A camera is easily attached on either one of the oculars or a third tube mounted in the ocular head and can be removed at will. Either a 35-mm or Polaroid camera with a microattachment can be used. In addition, a light meter can be used accurately, since the microscope-camera assembly is continuous. Photographic quality obtained with the 100× oil immersion lens of the barrier-installed microscope compares equally well with that obtained with the microscope before installation within the barrier system.

LITERATURE CITED

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